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REVIEWS.

Morsch's Eisenbetonbau Translated.

CONCRETE-STEEL CONSTRUCTION.—(Der Eisenbetonbau). By Prof. Emil Mörsch, of the Zurich Polytechnic, Zurich, Switzerland. Authorized Translation from the Third (1908) German Edition, revised and enlarged, by E. P. Goodrich, Consulting Engineer. New York: The Engineering News Publishing Co. London, England: Archibald Constable & Co., Ltd. Cloth; 6½ × 9¾ ins.; pp. 368; folding plates and numerous text illustrations. $5, net.

Since the publication of its first edition in 1902, Mörsch's "Der Eisenbetonbau" has been one of the leading authorities on concrete in Europe. Three editions have been run through since that time, each one bringing to date the changing standards and knowledge of the industry, and it is the last of these, dated November, 1907, that is here translated into English. Filling as it does a field peculiar to itself, that is, the rational application of the experimental knowledge concerning concrete to its theoretical design, "Der Eisenbetonbau" should have been made available to English readers before this, but although the original latest edition is over two years old, the matter contained therein, while not entirely new to American engineers, is so logically arranged that it overlaps but occasionally upon the numerous existing books on concrete.

Prof. Mörsch is a professor in the Zurich Polytechnic and at the same time the director of the technical service of one of the largest concrete engineering firms in Europe, so that in his joint capacity he is acquainted with both the theoretical and practical ideas of the concrete industry. It is quite evident that the book is directly the result of this dual interest; obviously it is an effort to correlate the theoretical considerations of design with the practical restrictions of construction and with the knowledge gleaned from experiments. The book is divided into four parts: an introduction outlining the general principles of reinforced concrete; a part headed "Theory of Reinforced Concrete," which is mostly descriptions of experiments; two chapters on the "Application of Reinforced Concrete" and finally an appendix containing official specifications for reinforced concrete work.

The introductory chapter is unsatisfactory. The information in it is too scattered to be of any use to one who already understands the elements of reinforced concrete; it does not pretend to present the elements of the subject to the beginner. There seems to be no good reason why all the matter could not have been incorporated in the remaining chapters of the book.

The second part contains the meat of the book. It is divided into chapters on the various properties of concrete and reinforced concrete, such as strength, elasticity, shear, adhesion, torsion, extensibility, compression, bending, etc. The experiments concerning each property are first given and then, with these experiments as a basis, the theoretical relation of the property to design is developed. For the most part the experiments are taken from European sources, but some American tests are drawn upon. In general the noticeable thing about the tests is their peculiar adaptability to the subject with which they are joined and the admirable conclusions that are drawn from them. Nowhere in the literature of concrete have tests been utilized to such an advantage in the analysis of structures or in the theory of design.

It may be well to call attention to some points in particular in this portion of the book. On p. 19 we find the account of a long-time test on the compressive strength of 7.8-in. 1:2½:5 pebble concrete cubes which show crushing values per inch of 2,873 lbs. at 7 days, 3,613 lbs. at 28 days, 4,722 lbs. at 5 months, 7,396 lbs. at 2 years 8 months and 8,107 lbs. at 9 years. We believe this to be an unprecedented increase in compressive value and think that its conclusion as a typical case is not warranted. In the tests on hooped columns, the author, who apparently is greatly in favor of Considère's design, omits to give any of the deflection values which demonstrate that the additional strength of hooping does not begin to act until the deflection of the hooped column is equal to that of a similarly loaded plain concrete column of equal concrete section.

In contrast to these two objections special reference should be made to the complete treatment of the subject of shear and of the stirruping of beams. American literature has nothing upon this subject which approaches it. If read and understood it should remove much of the misconception that is now held on this subject by many engineers.

In the development of formulas, Prof. Mörsch follows foreign practice so far as to make his mathematics as complicated as possible. At first sight all German formulas for reinforced-concrete design seem to be intrinsically more involved than the familiar American formulas, but closer scrutiny shows that this is merely the racial spirit to refrain, as far as possible, from any clarity in mathematical expression. Mathematics, to the German or French engineer, is a complicated machine to be handled with all due regard for its delicate parts. To the American it is a tool to perform certain functions; its simplification must be reduced to the limit of utility. For this reason we do not expect the adoption of Prof. Mörsch's formula into American practice, but we do think that the experiments which he has collected will prove of the greatest value to American engineers in their analysis of concrete structures and in the development of theory.

The third part describes in some detail a number of reinforced-concrete structures which have been built in Europe, principally in Germany. The distinguishing feature of all these structures is the rigidity of the reinforcement and the thoroughness of connections, a detail in which the Europeans are far in advance of those on this side the ocean, and which could well be studied by all of our engineers.

The final chapter contains the "Preliminary Recommendations for the Design, Construction and Testing of Reinforced-Concrete Structures," prepared by a committee from various German technical societies, and the "Regulations of the Royal Prussian Ministry of Public Works for the Construction of Reinforced-Concrete Buildings." These two specifications give concisely the best abstract of the standards of design and construction in Germany at the end of 1907. The industry at that time had reached such a stable state that very few changes have taken place since then and the specifications are still applicable to-day.

THE ENGINEERING INDEX ANNUAL FOR 1909.—Compiled from the Engineering Index Published Monthly in the Engineering Magazine during 1909. New York and London: The Engineering Magazine. Cloth; 6½ × 9½ ins.; pp. 471. $2.

With the exception of the increased size to meet the growing technical periodical literature, the Engineering Index Annual for the past year shows no difference from those of the past three years. Experience has shown the publishers that the arrangement of the articles under subjects, which in turn are collected in classes, is of more value to the searcher than the customary arrangement of subjects in alphabetical order, regardless of the class.

A New Edition of "Thomson's Bridge and Structural Design."

BRIDGE AND STRUCTURAL DESIGN.—By W. Chase Thomson, Assistant Engineer, Dominion Bridge Co., Montreal, Canada. (Second edition.). New York: The Engineering News Publishing Co. London, England: Archibald Constable & Co., Ltd. Cloth; 6 × 9½ ins.; pp. 192; 82 illustrations, mostly in the text, and 12 tables. $2, net.

Thomson's simple presentation of the elementary phases of steelwork design was a useful, meritorious aid to the learner in its first edition. Now it has been rewritten, enlarged to double the original bulk, and fitted out with new drawings, and its usefulness has gained correspondingly. It is of course not feasible to make an elementary book of this nature complete, and necessarily there will be many points where half-truths are stated, or important limitations grazed over. The reader of the book should, however, be able to recognize its restrictions, and should be led to wider reading after he has mastered this much. Perhaps the author could have helped to ensure this by occasionally referring the reader to other books containing broader treatments, by a warning that this or the other design shown is not necessarily beyond criticism, by stating that not all the detail computations or reasons of design could be presented in the limited space, etc.

The book begins with a very short treatment of graphic statics, and the moment principle of determining equilibrium. Then follows an explanation of stresses in beams, with a painstaking statement of the method of calculating moment of inertia and a demonstration of the variation of shear over the cross-section. Deflections of beams are treated by the principle which makes use of the moment area, this being applied very effectively and clearly. Next, a short chapter on columns, containing even a discussion of transverse shear and lattice stress, commends itself, particularly because Euler's formula is not dragged in. Practical examples are introduced with a few pages on loads and stresses, and on riveting. The examples are: a tier building, two roof-trusses, a plate-girder, a low-truss Warren highway bridge, and a pin-connected truss bridge. Ten tables of stress coefficients for Pratt, Warren and double-intersection Warren trusses end the book.

TECHNISCHER FUEHRER DURCH WIEN.—Issued by The Austrian Society of Engineers and Architects. Edited by Martin Paul, Stadtbauinspektor. Vienna, Austria: Gerlach & Wiedling. Leather; 5 × 8 ins.; pp. 645; two folding maps and numerous text illustrations. 17 marks; American price, $6.80.

An engineering guide through Vienna—if such a work were available for each one of the world's important cities, what a valuable library of reference the set would form! But there are very few in existence. The present one may well be ranked as the best yet produced, counting both excellence and conciseness. It is the enterprise of the Oesterreichische Ingenieur und Architekten Verein, which society is to be congratulated on the undertaking. The different chapters are written by different men, all chosen for their special fitness to treat of the particular subject. The first part (40 pp.) gives with great brevity a summary of location, topography, climate, geology, hydrography, government and administration, etc., with a chapter on the available constructive materials. The second part (200 pp.) covers transportation, postal and wire facilities, streets, sewerage, water and lighting supply, bridges, rivers and canals, etc. The third part (290 pp.) is devoted to buildings. Two chapters of 30 pages each, on art and industry, conclude the work. Its equipment and binding are worthy of the contents.

A German Text-Book on Technical Physics.

Reviewed by S. J. ZOWSKI*.

LEHRBUCH DER TECHNISCHEN PHYSIK.—By Hans Lorenz. Vol. III.: Technische Hydromechanik. Munich and Berlin, Germany: R. Oldenbourg. Paper; 5¾ × 9 ins.; pp. 500; 205 illustrations in the text. 14 marks; American price, $5.60.

This is the third volume of a text-book on "Technical Physics," which is being written by Prof. Dr. Hans Lorenz, of Danzig, for the purpose of furnishing engineers with a more up-to-date treatment of the fundamental science of their profession than has previously existed. In the first two volumes Mechanics of Rigid Bodies and Thermodynamics were treated. The third volume is devoted to Hydromechanics, and the fourth, now in preparation, will deal with the Theory of Elasticity.

In the general arrangement of the different subjects pertaining to Hydromechanics and of the methods of analysis, the author takes the natural course of beginning with the easier problems and simpler methods and then gradually introducing the more complicated questions and more explicit methods. After a chapter of 57 pages dealing with Hydrostatics, by far the larger part, or 5 chapters of 395 pages, is devoted to Hydrodynamics, whereby in the first half the simplified one-dimensional theory and in the second half the more explicit three-dimensional theory is given. This is followed by a chapter giving the history of Hydromechanics.

Although the first chapter, on Hydrostatics, is shortened to the minimum, nothing of importance has been omitted, and even a few well-written pages on surface tension have been inserted, which subject, so far, quite unjustly, seemed to be of almost no interest to engineers.

In the second chapter, after having made clear on what simplifying assumptions the so-called one-dimensional or flow-line theory is based, the author devotes 110 pages to stationary flow. First, the general energy and continuity equations and Bernoulli's theorem are derived and then the conception of pressure and velocity head is introduced and illustrated by the theory of the Venturi meter. Also a brief introduction to the theory of whirling motion is given, which subject is taken up more exactly in the three-dimensional theory. The question of the frictional resistance of pipe lines is, in the opinion of the reviewer, dealt with too briefly, for a text-book written for engineers. The experimental data, and especially the investigations of Mr. Biel, should have received more attention on account of their great practical value.

The next pages, dealing with the theory of efflux and sudden speed changes or hydraulic impact, including the application of this theory to the ejector, are written very clearly, as are also the pages dealing with the flow due to change of the specific weight of the fluid caused by change of temperature or air admission (air-lift pumps). The treatment of flow in open channels, however, is, like the treatment of flow in pipes, too brief, and will scarcely satisfy the needs of civil engineers. More elaborated is the problem of reaction and the application of the laws of reaction to the theory of turbo-machines. After a derivation of the well-known equations for the forces, the moment and the work of reaction a general theory of water turbines, centrifugal pumps and propellers is given, whereby the equations for work, moment, efficiency, pump characteristics and propeller thrust are derived and numerical problems given.

In the third chapter the one-dimensional theory of varying flow is given. After the theory of emptying vessels and that of oscillating motion in communicating pipes, the important question of pressure fluctuations in pipe lines is taken up, first in a general way and then as applied to supply pipes of turbines and pressure mains of centrifugal pumps. Also the theory of automatic pump valves is given, leading to an equation which is identical with the well-known empirical equation given by Prof. Bach and expressing the relation between the closing force, the speed of flow and dimensions of the valve. In the theory of reciprocating pumps the question of the variable pressure acting on the plunger is dealt with, and the conditions under which continuity of flow is preserved are derived; also the value of air chambers is demonstrated. Then follows the theory of the hydraulic ram. Alliévi's theory of water hammer, considering the effect of the elasticity of the pipe material, is omitted, but will be given in the fourth volume, together with the theory of elasticity. A few pages dealing with the waves in jets and canals and with the theory of the tides bring the third chapter to an end.

The following three chapters give the more exact three-dimensional theory, and it will be mainly on account of these chapters that this book will prove very valuable to all progressive engineers. There was a great need for a text-book that would enable the engineer to become acquainted with the newer theories without compelling him to resort to the extensive literature on this subject. These new theories, abstract as they may seem at the beginning, are becoming more and more practical in the work of the engineer. The fact has been well known to all turbine designers, for instance, that computations based on the stream-line theory are misleading, especially with the modern types of high-speed runners, where the water streams flowing through the buckets are conspicuously far from being "one-dimensional."

After the derivation of Euler's fundamental formulas and the introduction of Helmholtz's velocity potential and the "potential of external forces," the author derives among others the important law that the various resultant velocities are always perpendicular to the surfaces of equal potential, and that the distances of the surfaces of equal potential are inversely proportional to the velocities. Then taking up the special case of a two-dimensional flow by assuming that there is no motion in the third axis he shows the effect of sharp edges and rectangular bends and analyzes the phenomenon of a cylindrical and elliptical body moving through stationary fluid. The discussion of the flow conditions which prevail in the case of a channel discharging into a lake, or vice versa, leads the author logically to the question of contraction of a stream issuing from an orifice. The three-dimensional theory of bodies moving through a fluid is taken up only in connection with a ball. A few pages devoted to the theory of waves and ship motion without and with gyroscope bring the fourth chapter to an end.

In the fifth chapter the whirling motion and rotation is taken up. After a brief introduction of Helmholtz's theorems and the introduction of the component of whirling motion into Euler's equations, all fundamental equations of motion are expressed in cylindrical coordinates. Then taking up the special case of a flow which, while being three-dimensional is symmetrical to one of the axes, the author prepares the ground for his own turbine theory, of which only an abstract is given in the last 13 pages of the fifth chapter.

For criticisms of this theory, which was published by the author in 1907 in a book entitled "Neue Theorie und Berechnung der Kreiselräder," readers are referred to the various discussions which appeared in the leading German periodicals and mainly in the "Zeitschrift für das gesammte Turbinenwesen." The reviewer, however, wishes to take this opportunity to state that, whatever might be said against the practical application of this theory, it must be admitted by all that it is a great step forward in the scientific analysis of the very complicated conditions of flow in turbo-machines.

So far, with the exception of only a few pages in the second chapter, in which the empirical consideration of fluid friction was taken up, the fluid was assumed to be ideal. In the sixth chapter this assumption is dropped, and the Navier-Stoke theory of viscous fluids is given, whereby the equations are transformed to cylindrical coordinates. The experiments of Hele-Shaw, Osborne Reynolds and of Williams, Hubbel and Fenkell are discussed. In the theory of rotation, also, friction of bearings is taken up theoretically, and reference is made to Stribeck's latest experiments. The theory of groundwater flow and ship resistance bring this chapter to an end.

The seventh chapter gives the history of the development of Hydromechanics, and adds to the value of the book considerably.

Summarizing, it may be said without hesitation that, like all other books of this modern writer on engineering subjects, his "Technische Hydromechanics" ranks among the best publications of recent times.

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DIE ERMITTLUNG DER NEBENSPANNUNGEN EINERNER FACHWERKBRUECKEN.—Und das Praktische Rechnungsverfahren nach Mohr. By W. Geller. Also, Appendix, with examples by J. Karl. Berlin, Germany: William Ernst & Sohn. Paper; 6¾ × 9¾ ins.; pp. 131; 151 illustrations, mostly in the text. 6 marks; American price, $2.40.

This monograph affords a clear and readable explanation of the analytical methods for computing the secondary stresses in rigid-joint frames. Several examples taken from practice are fully calculated, so that the reader has before him in detail all the steps of the work and the results. One of the bridges calculated was also used for a series of measurements of deflections and elongations, under known live-load, and from the measured values the stresses were computed, thus affording a check on the computed secondary stresses. The two sets of values are in good agreement. Rather remarkably, the author concludes that direct measurement of elongations in a member is of little value for determining secondary stresses, individual measurements showing large and erratic variations. He recommends that the best quantity to measure is the deflection angle of the chords at the panel-points, which angles are little subject to local error and give good agreement with the computed values. A sensitive level is the only instrument needed for this measurement, but of course no measurement is possible while the load is in motion.

METHODS USED IN PRELIMINARY WORK ON CATSKILL RESERVOIRS.—For a 500,000,000-Gal. Daily Supply for the City of New York. By J. S. Longthorn. (Presented before the Brooklyn Engineers' Club, Jan. 9, 1908.) New York: The Engineering News Publishing Co. Paper; 6 × 9 ins.; pp. 53 to 158; folding and other plates, and text illustrations. $1, net.

A somewhat detailed account of the various lines of exploratory work preliminary to the designing and building of the Catskill reservoirs for the additional water-supply of New York City was presented before the Brooklyn Engineers' Club in 1908. The account has since been revised to include information for the year 1908, and the resulting pamphlet of 100 pages has been put on sale. The pamphlet contains a considerable amount of detailed information relating to wash borings and diamond borings made at the site of the Ashokan and other dams. Detailed studies of the samples obtained from borings designed to show their true relation to the actual material encountered are given. There are also presented detail and other drawings of boring apparatus.

Besides the matter relating to borings, information is presented regarding soil investigations, meteorological observations, stream-discharge observations, triangulation and topographical work, and related subjects.

STATE BOARD OF HEALTH (Massachusetts).—Annual Report for the year ended Nov. 30, 1908. (Henry P. Walcott, M. D., Chairman.) Boston, Mass.: Pub. Doc. (No. 34). Cloth; 5¾ × 9 ins.; pp. 876; folding and other plates, and text illustrations.

This always valuable annual report is made much more valuable this year through the inclusion of a review of the Lawrence Experiment Station's experiments on sewage purification, carried on during a period of 21 years. The review occupies nearly 300 pages of the report, and contains a vast amount of information of great value and interest to all who are following the development of sewage disposal. This portion of the report has been printed separately and has already been briefly noted in these columns.

The usual advice given to cities and towns regarding water-supply and sewerage also find a place in this year's report, together with many

analyses of public water-supplies, water-supply statistics for the state, an account of the water-filtration experiments conducted at Lawrence during the year, and various statistical and other reports dealing with the health of the state and related subjects.

Corrosion and Its Prevention.

THE CORROSION AND PRESERVATION OF IRON AND STEEL.—By Allerton S. Cushman, Ph.D., Assoc. Am. Soc. C. E., Assistant Director and Chemist in charge of Physical and Chemical Investigations, Office of Public Roads, U. S. Department of Agriculture, and Henry A. Gardner, Director, Scientific Section, Paint Manufacturers' Association of the United States. New York and London: McGraw-Hill Book Co. Cloth; 6¼ × 9½ ins.; pp. 373; 68 illustrations in the text. $4, net.

This book will appear to most readers, probably, as one of the important technical publications of the year for at least two reasons. First, there is the universal interest in the corrosion problem and the economic importance of reducing a great industrial waste. Second, there is no other single volume, between the lids of which can be found in readable form the essential parts of a huge literature—articles, papers, discussions, pamphlets, books—on corrosion and its prevention.

A survey of all this literature shows that knowledge of causes at work in corrosion phenomena is still limited and that theory often has been accepted as fact. One may well believe that present efforts for the protection of iron are of a transitional nature, although even this early, the methods developed are a decided advance. Every reader of this book will do well to remember that a book dealing with science and art in such an unsettled condition cannot but be written in a hesitant way. A few persons, particularly those already acquainted with the development under way, may dislike a book so soon to be out of date. But most people will welcome it as an approach to understanding problems which are new to them and which they appreciate only in a hazy way.

The authors have professed their intention and attempt to bring their text out of the dark depths of a strange vocabulary, in which physical chemists have been wont to speak and write, so that more ordinary men, like paint manufacturers, practising metallurgists and engineers generally, may read and appreciate. The endeavor has been to elucidate and not to eliminate the terms at which many have seemed to take fright—actually to add to the reader's mental equipment the very ideas which he may have felt beyond his ready grasp. If the reader will consent to studiously apply himself to these explanations separately and in order, then he will find that this book will become a practical help to a working theory and a source of useful information.

Such a book as this, to be anything less than an encyclopedia, must be of a rather general nature. Specific instances of phenomena have been quoted but evidently for their illustrative value. The volume becomes perhaps less general as it takes up protection problems and discusses pigments and paints. The authors have felt free to draw in liberal measure from previous papers and discussions. Indeed, there are parts of the book where the authors present work has been only to knit these paragraphs together. Full credit has been given throughout to the earlier works so that extension studies are everywhere possible. There are appended some 60 pages of bibliography showing practically all the literature on the subject.

The first part of the book presents general views of the widespread troubles resulting from increased corrodibility of modern iron structures. Next is a preliminary short course in physical chemistry. This chapter, entitled "The Theory of Solutions," contains some 15 short popular lectures on "water as a solvent," "solution pressures," "ozmotic pressures," "electrolytic dissociation," "hydrolysis," "electrolysis," "ion formation," "oxidation and reduction," "polarization," "passivity," "properties of colloids," etc.

Thus initiated almost any reader can pass along and appreciate the discussions of old and new theories of rusting, the applications of the new (electrolytic) theory, and the inhibition or stimulation of corrosion. From here the volume takes a new turn into the commercial protection of iron and steel against rust.

The ideas in the single-page and two-page "lectures," already noted, are easily understood by one acquainted with the bare elements of chemistry and are indeed a key to much that has been unintelligible to one who has not tried to follow the rise of physical chemistry. After this are short discussions of the carbonic acid, peroxide and electrolytic theories of rusting, in which very free extracts are made from other works. In the chapter on the application of the electrolytic theory, the benefits of securing a metal free from various impurities, initial stresses, etc., is shown. At this point, is a sort of digression on the absorption of gases, especially hydrogen, and on the effect of such dissolved or absorbed gases on corrodability. Similarly the role of carbon is taken up. Following all this is another pertinent discussion into the results of several more or less academic investigations of the influence of deforming stresses, such as cold rolling, on relative corrodibility.

In discussing acceleration tests, the specification of the American Society for Testing Materials for acids are reprinted, but its questionable value, in comparing very dissimilar samples and for showing what may be expected of a sample under natural conditions, is properly emphasized. Application of the electrolytic theory to certain observed phenomena, at first apparently conflicting, is cited as a further confirmation of the belief that corrosion is an electrochemical action primarily. In this way the effects of dissolved oxygen, in otherwise pure water, are compared with decreased trouble occasionally noted with less pure waters with insignificant oxygen burden. Under the chapter heading "Inhibition and Stimulation" are grouped a number of miscellaneous observations on bichromate and alkaline solutions, varnish films, etc.

Here closes the more theoretical part of the book and here begins the more practical—the part describing recent efforts and results in the protection of iron and steel through coatings of other metals, of oxide films and of paints or varnishes. The methods of putting on the protecting coatings of zinc, in the few processes of "galvanizing," are but briefly set forth to make room for present commercial and proposed tests of the galvanized metal. After briefly mentioning other metallic protection, the authors describe the Bower-Barf and similar processes for securing a protecting oxide layer.

A series of experiments undertaken by a committee of the American Society of Testing Materials to classify the common pigments as "stimulators," "inhibitors" or "indeterminates" are described and the results are shown in tables and diagrammatically. From this and later work, the authors have been able to formulate a few general rules as to the characteristics which an inhibiting pigment must show and in a very general way as to the make-up of protecting paints.

Much space is devoted to a description of the steel test panels, erected in 1908 at Atlantic City under the supervision of the American Society for Testing Materials and of the Paint Manufacturers' Association, and on which an extensive and careful service test is being conducted with various pigments and carriers. The authors cautiously refrain from imparting any knowledge of the results there obtained—holding that, while they have had much to do with the tests, the report of results must await the pleasure of the committee in charge.

The several disintegrating action of common paint films are described and one device, a little portable photomicroscope, is shown as used in examining the Atlantic City panels. The authors feel at liberty to describe still other test panels on which paints are now being examined, but they do not feel at liberty to disclose results and the reader has only the cold comfort of knowing that in a few years more there may be available a great store of useful knowledge.

Much space is devoted to paints for particular service. Here the various combinations of pigments and carriers that have been found most advantageous for certain surfaces are described. As a single instance, the authors hold that the prevalent method of roughening galvanized iron, by chemicals, to make a paint stick better is improper and unnecessary, if proper paints be selected. A sharp siliceous pigment in a varnish vehicle is recommended as a suitable priming coat which will receive any good covering coat. In a similar practical way the requirements of steel cars, tunnel work, water tanks, structural steel, cooling and pipe systems and the use of bituminous paints, tars, etc., are discussed. There are finally two chapters summarizing the working properties of pigments and carriers.

PRACTICE AND THEORY OF THE INJECTOR.—By Strickland L. Kneass, M. Am. Soc. M. E., etc. Third edition, revised and enlarged. New York: John Wiley & Sons. Lond. England: Chapman & Hall, Ltd. Cloth; 5¾ × 9¼ ins.; pp. 175; 53 illustrations in the text. $1.50; English price, 6s. 6d., net.

As far back as 1898, when the second edition of Mr. Kneass' work appeared, the first edition had secured general recognition as a standard text and reference book. The second edition, in turn, has now been brought up to date for this the third edition. The present changes seem to be largely in the nature of substitutions of matter on new designs in place of obsolete ones. A chapter has been added to cover a few topics like feed-water heating, efficient feeding, fuel-mileage records of locomotives, scale-bearing water and check valves.

The present edition first gives the history of the injector and a discussion of the principle of its action. Following are the results of investigations on the action of the various parts of the injectors and the numerous applications of injectors. Under this latter head are shown many commercial designs now available. The determination of proper size of injector for certain duty is discussed and, after this, testing methods and results.

DER BRUECKENBAU.—Lehr- und Nachschlagebuch für Studierende und Praktiker. By M. Strukel, Professor in the Technical College at Helsingfors. Part I., Vol. I. Allgemeines, Statik der Brückentrager, Erddruck und Holzerne Brücken (teilweise). Leipzig, Germany: A. Twietmeyer. Paper; 7½ × 10¼ ins.; pp. 216; 225 illustrations in the text.

An atlas of drawings relating to wooden and metal bridges was published by Prof. Strukel ten years ago. The present issue is a reprinting. But at the same time there appears the first part of a complete text on bridge construction, to which the atlas will be an auxiliary. This first part deals with general theory of bridges and some of the detail design of wooden bridges. The remaining matter relating to wooden and steel bridges will follow in a second volume, while movable bridges and stone bridges will be treated in a third.

THE INVENTOR'S POCKET LIBRARY.—Leaflets 1 to 10. Washington, D. C.: The Engineer Searching Co., 1403 New York Ave. Paper; 4 × 9 ins. 25 cts.

This series of tracts is written to give practical advice to inventors concerning the best methods of securing real protection for their inventions. The advice is generally sound and well considered, and should be of much value to the inexperienced inventor, at least, and even to many inventors who have more or less experience in patent-office affairs. The publishers seem to have some connection with the Brotherhood of Inventors, an organization formed in Washington in March, 1910, which, according to its prospectus, hopes to bring about some important reforms in patent-office and patent-law practice, which are greatly needed for the protection of inventors.

STATISTICAL REPORT OF LAKE COMMERCE.—Passing through Canals at Sault Ste. Marie, Michigan and Ontario during Season of 1909. With a Supplementary Report of Commerce Passing through the Detroit River. Prepared under direction of Col. C. McD. Townsend, Corps of Engineers, U. S. Army. (Detroit, Mich.: U. S. Engineer Office.) Paper; 6 × 9 ins.; pp. 28; text illustrations and one folding plate.

This annual statistical pamphlet is filled with tables covering the general subject of lake commerce.

A British Text-Book on Fuel.

Reviewed by JOSEPH W. RICHARDS,* M. Am. Inst. M. E.

FUEL AND REFRACTORY MATERIALS.—By A. Humboldt Sexton, Emeritus Professor of Metallurgy in the Glasgow and West of Scotland Technical College, Past President of the West of Scotland Iron and Steel Institute, etc. New and revised edition. New York: D. Van Nostrand Co. Cloth; 4¾ × 7¼ ins.; pp. 364; 1 plate and 104 text illustrations. $2.50, net.

The author is Emeritus Professor of Metallurgy in the Glasgow and West of Scotland Technical College. This fact explains the chief characteristics of the book; it leans toward the academic side of the subject, prefers British measures to the metric system, and omits some subjects which have not been strongly developed in Great Britain.

The author's explanations of the combustion of carbon and of flame are antiquated. To say that carbon burning at a low temperature gives CO^2 gas, that the proportion of CO increases as the temperature rises, and that the product is almost entirely CO at 1,000° C.—is to give a vast amount of misinformation in a few words. The calculations of calorific intensities of various fuels are so far wrong as to be valueless, because the use of the wrong specific heats of the gases. It is a pity that Goutal's formula for calculating the calorific power of a coal from its proximate analysis is not mentioned; it is a valuable method. The burning of powdered coal is virtually omitted; a description of the practical methods in such large use in America would have been highly desirable. The use of carborundum as a refractory lining material is important for many metallurgical uses, and should have been described.

Having called attention to the defects just noted the reviewer wishes to commend the larger part of the book as being finely written and having a large field of usefulness. It is readable, clear and usually accurate, covering a description of fuels, recovery of by-products, classification of furnaces, pyrometry, calorimetry, and refractory materials. Students of metallurgy will find it particularly suited to giving them clear ideas on these subjects, and practical men in other lines will find much useful information put in easily comprehensible form.

THE COPPER HANDBOOK.—A Manual of the Copper Industry of the World. Vol. IX. Compiled and Published by Horace J. Stevens, Houghton, Mich. Cloth; 5¾ × 9 ins.; pp. 1,628. $5.

When one examines this book and notes the great amount of varied information about copper mines and mining concerns (something more than 7,700 such are listed, in notes varying from a few lines to 16 pages), one readily understands why the 1909 volume appears rather late in 1910, if the compiler has, as the preface states,

> had no assistance, except of a purely clerical nature in the preparation of the work.

One readily appreciates, also, another statement in the preface that

> the work of preparing an annual revision of the work along the lines that have been followed in the past is beyond the scope of one man's powers and for future editions it will be necessary that the labor be divided.

The compiler laments the lack of unity that will result where two or more minds are applied to different divisions of the same subject, but even should his darkest fears be realized (which we very greatly doubt) they will be amply compensated for by the regularity of issue and the reality of the annual revision.

The commercial mining notes are much as in previous volumes, but increased by some 800 new titles. The chapter on statistics, shows recent data on production, American imports and exports, world's trade, finance and price, several miscellaneous chapters give the history, chemistry; mineralogy, metallurgy, and uses of copper, alloys, brands, grades, mining terms. The reader is surprised, though not unpleasantly, at the humorous side remarks and occasional witticisms, that lighten the necessary dryness of some parts. The book in parts fairly bristles with the personality of the author.

As in years past, the publisher sends out the book by mail on request and subject to a week's inspection.

*Professor of Metallurgy, Lehigh University, South Bethlehem, Pa.

Beahan's "Railway Location" Revised.

THE FIELD PRACTICE OF RAILWAY LOCATION.—By Willard Beahan, Division Engineer, Chicago & Northwestern Ry. (Second edition.) New York: The Engineering News Publishing Co. Cloth; 6 × 9¼ ins.; pp. 254; folding and other plates, and text illustrations. $3, net.

Beahan writes of railway location with evident enthusiasm and close personal knowledge of all its details. He succeeds in imparting surprisingly much practical information, not only such as will facilitate the beginner's learning of the art but also such as may expand the horizon and perfect the methods of the practiced locating engineer. Location is an art of such peculiar characteristics and such manifold difficulties as to call for remarkable breadth of judgment and fullness of knowledge. That most of our railways were located by men who had never taken time to study out in set words the relations of the various factors concerned, and yet were located well, is to be credited partly to the excellence of these men, and partly to the fact that the factors are involved so intricately that instinctive judgment often perceives them earlier and values them more truly than any analytical effort can do. This impression indeed can be well obtained from the present book. And yet the book proves convincingly that the study of the geological, topographical and operating elements concerned is bound to save the locating engineer from many errors, great and small.

Mr. Beahan's work was reviewed appreciatively in our issue of May 14, 1905. The changes in this second edition are not extensive, and no further comment is necessary. The author took opportunity for minor improvements, but in the main the book stands as first issued. As there is no other work covering the same ground, its satisfactory thoroughness and practical detail are specially gratifying, and they give assurance that Beahan's book will long remain the chief text in its field.

TABLES AND DIAGRAMS FOR OBTAINING THE RESISTING MOMENTS OF ECCENTRIC RIVETED CONNECTIONS.—By E. A. Rexford. New York: The Engineering News Publishing Co. Boards; 7¾ × 10¼ ins.; pp. 32; numerous illustrations. $1, net.

Some two dozen pages of diagrams make up this book. Each diagram is a simple circle diagram correlating two rivet-shears acting at an angle with each other, and the resultant rivet-shear. Each diagram represents a particular arrangement, characterized by number of rows of rivets, spacing of rows, number per row and spacing in the row. A coefficient is given with each diagram, which expresses the moment summation value of the connection, in terms of $(\text{inches})^2$ times rivets divided by distance of extreme rivet, so that the quotient of torsional moment by this coefficient gives the shear on the extreme rivet. By the diagram, then, this shear and the direct-load shear are combined, the resultant shear being read off. The method is cumbersome, but it may be hoped that the book will make the computation of true rivet-shears in eccentric connections more common.

ENGINEERING THERMODYNAMICS.—By C. F. Hirshfeld, Professor of Power Engineering, Cornell University. Second edition, revised and corrected. New York: D. Van Nostrand Co. Boards; 3½ × 6 ins.; pp. 157; 22 illustrations in the text. 50 cts., net.

Some teachers of thermodynamics and allied subjects prefer, for their classes in the elements of thermodynamics, a small handbook into which the few fundamental concepts are compressed. One such work is Prof. Spangler's "Notes" and another is Prof. Hirschfeld's "Engineering Thermodynamics," the second edition of which is now at hand. It cannot be hoped that there would be anything really new or novel in the subject matter of this little text. All the teacher or student can reasonably demand is a clear presentation, in logical sequence, of the laws involved. The appearance of the second edition, of a work of limited circulation only, in three years after the publication of the first, may perhaps serve as an indication of the author's successful arrangement.

Elementary Perspective.

ELEMENTARY COURSE IN PERSPECTIVE.—By Sherman M. Turrill, Assoc. Am. Soc. C. E. New York: D. Van Nostrand Co. Cloth; 5 × 7½ ins.; pp. 16 illustrations, partly in the text. $1.25, net.

Two methods for perspective drawing are explained in this book, in both of which the perspective drawing is made from the drafted plan and elevation of the object. The first method, according to the author's preface, is discussed mainly for the assistance of the mechanical draftsman, whereas the second is intended for the artist and freehand draftsman. The methods for the free-hand drawing of a perspective view directly from the object itself are not touched upon at all in this volume.

The first method, "method by the use of the plan," involves drawing the orthographic projections of rays passing from the viewpoint, or point of sight, to the various points of the object. In the second method, "method by scale," the perspective of each point of the object is found by drawing the perspective projections on the plane of the picture of two horizontal lines lying in planes passing through the given point and making angles of 45° with the picture plane. The perspective of the point is found at the intersection of the perspectives of the two lines. The second method permits the work to be done on a smaller drawing board, since the plan and elevation of the object are used only for scaling and do not have to be tacked to the board in their correct relative positions, as in the first method.

The book is divided into two parts, dealing respectively with the two methods described. The introductory chapter of Part I. defines the terms peculiar to perspective, such as "picture plane," "vanishing point," etc., and explains the abbreviations and notations used in the subsequent chapters. The introductory chapter of Part II. describes in general terms the "method by scale" and compares it with the first method. The four remaining chapters of each part take up in order parallel perspective, angular perspective, perspective of curves and perspective of shadows.

The method of explanation throughout the book is by continual reference to lettered illustrations. The preface states that the author has assumed that the student is more or less familiar with descriptive geometry. It may be said, however, that only the barest knowledge of that study should suffice for an intelligent use of the book. Anyone familiar with orthographic projection as used in ordinary mechanical drawing could probably read it without too much effort. The structure of the author's sentences is not always above criticism from a grammatical standpoint, but their intended meaning is usually plain enough, even when not directly expressed.

REPORT OF COMMITTEE APPOINTED TO COLLECT DATA RELATING TO AWARDS FOR WATER AND WATER-POWER DIVERSION.—(Special Number of the Journal of the New England Water Works Association, Vol. XXIV., No. 1, March, 1910.) Boston, Mass.: The Association (715 Tremont Temple). Paper; 6 × 9¼ ins.; pp. 258; one plate, $2.

Within the past two or three years, the New England Water Works Association has appointed a number of special committees to collect information and report on subjects of particular interest to its membership. One of these has brought together a large amount of valuable information on awards for water and water-power diversion. This report, combined with discussion and with a paper by Mr. Charles F. Choate, Jr., of the Boston Bar, on "The Underlying Principles Governing Riparian Water Rights and Diversion Suits," makes up practically the whole of the March number of the Journal.

The committee was composed of the following members: Mr. Charles T. Main, Chairman; Messrs. Charles E. Chandler, Richard A. Hale and William Wheeler; and Mr. Leonard Metcalf, Secretary. A portion of the body of its report was printed in Engineering News of Dec. 1, 1909. The bulk of the report consists of "fundamental data" relating to awards for water and water-power, based on reports of a large number of takings. Much detailed information is given in these individual reports.

An extended bibliography forms a valuable part of the report.

A Valuable Pioneer Work on Municipal Franchises.

MUNICIPAL FRANCHISES.—A Description of the Terms and Conditions upon which Private Corporations enjoy Special Privileges in the Streets of American Cities. By Delos F. Wilcox, Ph. D., Chief of the Bureau of Franchises of the Public Service Commission for the First District of New York, and Author of "The American City," etc. In two volumes. Vol. I.: Introductory; Pipe and Wire Franchises. New York: Engineering News Book Department. Rochester, N. Y.: The Gervaise Press. Cloth; 5¾ × 8 ins.; pp. 710. $5, net.

In view of the important part played by municipal-franchise companies in meeting the multifarious needs of those who live or work in cities it is indeed strange, as the author of this book states, that no book dealing with municipal franchises has been published prior to the appearance of this one. The wonder increases when one calls to mind only a few of the many instances of the evil effects wrought jointly by franchise companies and by corrupt municipal authorities in the securing and granting of franchises or the evasion of franchise obligations. The lack of a book on this subject has not been because the need for one has not been felt. Rather, it has been because of the magnitude of the task of dealing with it adequately. Obviously, the task has increased with the continued failure to meet it. Fortunately, a combination of circumstances has at last arisen which has made possible the appearance of the long-needed book. Mr. Wilcox, for years a close student of municipal affairs, was recently made Chief of the Bureau of Franchises of the Public Service Commission for the First District of New York. In that position he has increased his store of information and ideas on the subject, and in addition to his official duties has found time to produce the volume before us.

The subject proved to be so large and has been dealt with so comprehensively, that a second volume will be required to carry out the plan of the author. Briefly, that plan is first to present the fundamental principles underlying franchise grants; then to set forth the essential features of a number of typical or special franchises in each class of utilities; and finally to discuss the taxation and public control of franchises. The first volume disposes of the fundamental principles and also of the typical franchises of all classes except those grouped broadly under the head of transportation.

Franchise fundamentals, or underlying principles, are dealt with in five chapters, comprising about a fifth of the present volume. "How Franchise Rights are Acquired" is the first of these chapters. This title may suggest practice rather than principles, but the text really considers both. In this chapter the author brings out some facts well known to students and observers but little understood by the public, namely, that franchises are "drafted by those who seek them," that "public authorities negotiate in the dark," and that aldermen do not have "expert advice" when granting franchises.

Under the chapter heading "Monopoly Profits and Ways of Limiting Them" the author takes up short-term and indeterminate franchises, selling franchises at auction, rate fixing in franchises and by city councils or other public bodies, the sliding scale, and the reservation of the right to purchase works by the city. "Injuries to Individuals and Ways of Preventing Them" forms the subject of the next chapter. In it are discussed safeguards of life and limb as well as of property; discrimination in rates; meter inspection, tribunals for hearing complaints, etc.

The final chapter in Part I. is entitled "Temptations to Public Wrong and Ways of Overcoming Them." Here bribery of public officials, jury fixing, influencing the judiciary, over-capitalization, monopoly advantages, the "elimination of special franchise values," and other like topics are discussed.

It may be gathered from the foregoing brief outline that the author considers a municipal-franchise company as an institution prone to evil and which should be kept in check at all points. Unfortunately, the history of hundreds of such companies warrants the assumption.

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Something of franchise principles is also presented directly and much indirectly in Part II., which, as already stated, is devoted to abstracts of actual franchises. Here the author takes up in succession: (1) Electric light, heat and power; (2) the telephone; (3) the telegraph; (4) messenger and signal services; (5) electrical conduits; (6) water-works; (7) sewerage; (8) central heating; (9) refrigeration; (10) pneumatic tubes; (11) oil pipe-lines; (12) gas, both artificial and natural. In considering each of these kinds of franchises the author first gives an idea of the nature and extent of the service rendered. In some cases he follows this by specific comment on the principles involved in franchises of the class under consideration, but for the most part such comment, when given, is brief.

The digests of franchises will be valuable to all who wish to know typical conditions imposed on the various classes of franchise companies by different cities. The digests represent much painstaking effort, both in collecting the franchises and in abstracting them for publication. Criticism accompanies portions of some of the digests.

The work as a whole cannot be fairly judged until it has been completed. That it is a most creditable and valuable contribution to the literature of municipal affairs and of the relations between public-service companies and legislative, administrative and judicial bodies generally is beyond question. If the space available in the final volume would permit, we should like to see the subject developed somewhat further and along rather different lines than appears to be contemplated by the author. It would be helpful to nearly all users of the work, we think, if the author would set forth, free from considerations of boodling, jury fixing, injury to individuals, an outline of a model franchise, and then take up briefly the variations required for each different class of franchise. This would involve some repetition of the matter given in Part I. of the present or first volume, and perhaps might best be left for a second and much briefer work, prepared, we venture to suggest, in collaboration with an engineer who had had long and varied experience in rate making and in the valuation of franchise works both for rate making and for purchase.

Publications Received.

AMERICAN PRODUCER GAS PRACTICE AND INDUSTRIAL GAS ENGINEERING.—By Nisbet Latta, M. Am. Soc. M. E., Author of "American Gas Engineering Practice." New York: D. Van Nostrand Co. Cloth; 7½ × 10¾ ins.; pp. 539; 247 illustrations in the text. $6, net.

THE ARKANSAS ASSOCIATION OF SURVEYORS AND CIVIL ENGINEERS.—Proceedings, First Annual Meeting, Dec. 31, 1909. (J. O. Jones, Secy., Birta, Ark.) Paper; 5¼ × 8¼ ins.; pp. 27.

CANALS AND TRADERS.—The Argument Pictorial, As Applied to the Report of the Royal Commission on Canals and Waterways. By Edwin A. Pratt, Author of "British Canals," etc. London, England: P. S. King & Son. Paper; 5½ × 8½ ins.; pp. 123; numerous folding and other plates. 1s., net; American price, 50 cts.

COMMISSIONER OF EDUCATION.—Report for the year ended June 30, 1909. Vol. II. Washington, D. C.: Pub Doc. Cloth; 5¾ × 9¼ ins.; pp. 599 to 1373.

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OMMISSIONER OF PUBLIC ROADS (New Jersey).—Annual Report for the year ending Oct. 31, 1909. (Frederick Gilkyson, Commissioner.) Trenton, N. J.: Pub. Doc. Cloth; 5½ × 9 ins.; pp. 215; 12 plates and large folding map.

URS DE MACHINES MARINES.—Part II. Machines Alternatives, Turbines Marines, Moteurs à Combustion Interne. By L. Jauch and A. Masméjean, Professors in the École des Mécaniciens at Toulon. Toulon, France: J. Aîné. Paper; 6½ × 9¾ ins.; pp. 887; 545 illustrations in the text; 51 plates in separate volume, 7¾ × 10¾ ins. 30 francs; American price, $9.

HE CYANIDE HANDBOOK.—By J. E. Clennell, Assoc. Inst. Mining and Metallurgy. Author of "Chemistry of Cyanide Solutions," etc., Cyanide Chemist to the Creston-Colorada Co. New York and London: McGraw-Hill Book Co. Cloth; 6¼ × 9½ ins.; pp. 520; 41 illustrations in the text. $5. net.

HE DISSEMINATION OF DISEASE BY DAIRY PRODUCTS, AND METHODS FOR PREVENTION.—Circular 153, Bureau of Animal Industry, U. S. Department of Agriculture; A. D. Melvin, Chief of Bureau. Washington, D. C.: Pub. Doc. Paper; 6 × 9 ins.; pp. 57; 11 illustrations in the text.

UST PREVENTIVES AND ROAD BINDERS.—By Prévost Hubbard, Assistant Chemist, Office of Public Roads, U. S. Department of Agriculture. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 5¾ × 9¼ ins.; pp. 416; 51 illustrations in the text. $3, net.

ELECTRIC POWER PLANTS.—A Description of a Number of Power Stations Designed by Thomas Edward Murray, M. Am. Soc. M. E., M. Am. Inst. E.E., President The Association of Edison Illuminating Companies, 55 Duane St., New York. Cloth; 6 × 9½ ins.; pp. 337; 152 illustrations in the text. For private circulation only.

HIGH MASONRY DAM DESIGN.—By Charles E. Morrison, Ph.D., Assoc. M. Am. Soc. C. E., and Orrin L. Brodie, Assoc. M. Am. Soc. C. E., Assistant Engineer Board of Water Supply, New York City. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 5¾ × 9¼ ins.; pp. 103; 19 illustrations in the text. $1.50, net.

A HISTORY OF THE LOGARITHMIC SLIDE RULE AND ALLIED INSTRUMENTS.—By Florian Cajori, Ph. D., Professor of Mathematics, and Dean of the School of Engineering, Colorado College. New York: The Engineering News Publishing Co. London, England: Archibald Constable & Co., Ltd. Cloth; 5 × 7¾ ins.; pp. 126 + x.; 17 illustrations, partly in the text. $1. net.

ILLINOIS STATE GEOLOGICAL SURVEY.—Year-Book for 1908. Bulletin No. 14. H. Foster Bain, Director. Urbana, Ill.: University of Illinois. Cloth; 5¾ × 9¼ ins.; pp. 394; five plates and five text illustrations.

METAL SPINNING.—Machinery's Reference Series, No. 57. New York: The Industrial Press. Paper; 6 × 9 ins.; pp. 38; 45 illustrations in the text. 25 cts.

THE PRINCIPLES AND PRACTICE OF IRONFOUNDING.—By E. L. Rhead, Lecturer in Metallurgy, Municipal School of Technology, Manchester. Manchester, England: The Scientific Publishing Co. Cloth; 5½ × 8¾ ins.; pp. 505; 247 illustrations in the text. 7s. 6d., net; American price, $3.

PROCEEDINGS OF THE WOOD PRESERVERS' ASSOCIATION (Sixth Annual Meeting).—Published by the Society; Secretary, F. T. Angier, Galesburg, Ill. Paper; 5¾ × 8½ ins.; pp. 168.

STATE WATER SUPPLY COMMISSION (New York).—Annual Report for the year ending Feb. 1, 1910. Part I.: Municipal Water Supply. Part II.: River Improvement and Flood Prevention. Part III.: Water Storage and Power Development. (Henry H. Persons, President Commission.) Albany, N. Y.: Pub. Doc. Cloth; 5½ × 9 ins.; pp. 492; folding and other plates, and three folding maps in pocket.

SUMMARY OF COMMONWEALTH PRODUCTION STATISTICS.—For the years 1901 to 1908. Production, Bulletin No. 3. Published under the authority of the Minister of Home Affairs by G. H. Knibbs, Commonwealth Statistician. Melbourne, Australia: Pub. Doc. Paper; 8¼ × 13 ins.; pp. 88.

SURVEY OF NORTHERN AND NORTHWESTERN LAKES.—Bulletin No. 19. To Supplement the Information Given upon the Charts of the Great Lakes, and Issued with those Charts from the U. S. Lake Survey Office, Detroit, Mich. Paper; 8 × 10 ins.; pp. 402; two folding sheets.

WATER PURIFICATION FACTS FOR STEAM USERS.—By J. C. Wm. Greth. (Read before Rochester Engineers' Club, Rochester, N. Y., Feb. 25, 1910.) Pittsburg, Pa.: Wm. B. Scaife & Sons Co. Paper; 6¼ × 9½ ins.; pp. 15.

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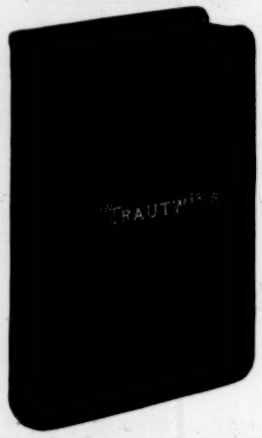

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